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Materiel Test Procedure 6-3-184
U. S. Army Artillery Board

3465
**U. S. ARMY TEST AND EVALUATION COMMAND
COMMODITY SERVICE TEST PROCEDURE**

INFLATION, TETHERING, AND LAUNCHING EQUIPMENT (METEOROLOGICAL)

1. OBJECTIVE

The objective of this test procedure is to describe the methods used to determine the degree that meteorological balloon inflation, tethering, and launching equipment perform the mission as described in the Qualitative Materiel Requirements (QMR), Small Development Requirements (SDR), and Technical Characteristics (TC) and the suitability of the systems and the maintenance packages for use by the Army.

2. BACKGROUND

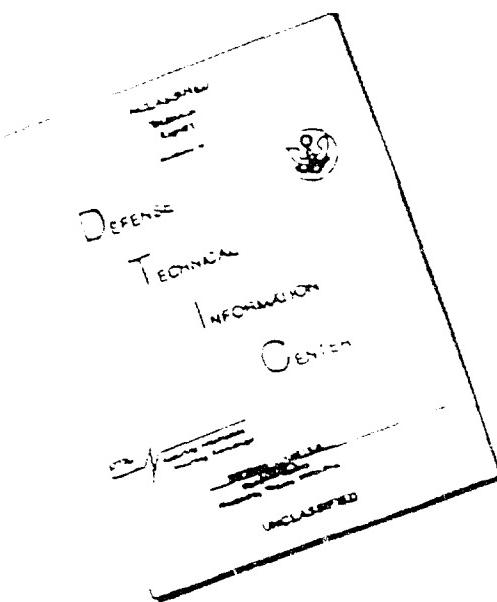
With the advent of taking upper-air measurements with electronic equipment consisting of a balloon-borne radiosonde and ground-based tracking devices, artillery meteorological sections were issued Meteorological Station Sets for utilizing sounding balloons. The soundings were used almost exclusively to produce meteorological information to be applied to artillery firing data. The requirement for increased reliability of taking artillery meteorological soundings and the higher altitude required for preparing radiological fallout predictions and weather service messages resulted in larger balloons to withstand ascents to extremely low atmospheric pressures. In addition, higher ascent rates were required to minimize the low elevation angles of the tracking equipment and to decrease the time required for observation. The development of improved sounding balloons has been pursued for several years and thus causes a continuing need for reliable ground supporting equipment which will not detract from the overall system performance.

3. REQUIRED EQUIPMENT

- a. Suitable Test Sites and Facilities, for conducting the applicable subtests.
- b. Maintenance Support Facilities.
- c. Communications Equipment and Facilities, as required.
- d. Equipment and Facilities, as required by the referenced MTP's.
- e. Vehicles for Transporting of Test Equipment and Personnel, as required.
- f. Acoustic Aids.
- g. Optical Instruments.
- h. Camouflage Materials, as required.
- i. Aerial Cameras with Film.
- j. Aerial Photo Interpretation Facilities.
- k. Replacement Parts, as required.
- l. Road Test Courses, as follows:
 - 1) Paved roads
 - 2) Unpaved roads
 - 3) Cross-country terrain

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- m. Meteorological Balloons, as required.
- n. Balloon Inflation Shelter, as required.

4.

REFERENCES

- A. USAMC Regulation 385-12, Safety.
- B. USATECOM Regulation 385-6, Safety Release.
- C. USATECOM Regulation 385-7, Safety Confirmation.
- D. USATECOM Regulation 750-15, Maintenance Portion of the Service Test.
- E. MTP 6-3-180, Meteorological Equipment.
- F. MTP 6-3-182, Balloons (Meteorological).
- G. MTP 6-3-512, Compatibility with Related Equipment.
- H. MTP 7-3-512, Air-Drop Capability (Suitability of Equipment For).
- I. MTP 7-3-515, Air Transport, Internal (Suitability of Equipment For).
- J. MTP 7-3-516, Air Transport, External (Suitability of Equipment For).
- K. MTP 10-3-500, Preoperational Inspection and Physical Characteristics.
- L. MTP 10-3-501, Operator Training and Familiarization.
- M. MTP 10-3-503, Surface Transportability (General Supplies and Equipment).
- N. MTP 10-3-504, Maintenance Evaluation.
- O. MTP 10-3-505, Human Factors Engineering.
- P. MTP 10-3-506, Battlefield Mobility (Battlefield Mobility, Tactical Flexibility and Portability).
- Q. MTP 10-3-507, Safety Hazards.
- R. MTP 10-3-508, Adverse Conditions.
- S. MTP 10-3-509, Ease of Assembly and Disassembly.
- T. MTP 10-3-510, Logistics Over-the-Shore (LOTS) (General Supplies and Equipment).
- U. MTP 10-4-001, Desert Environmental Test of General Supplies and Equipment.
- V. MTP 10-4-002, Arctic Environmental Test of General Supplies and Equipment.
- W. MTP 10-4-003, Tropic Environmental Test of General Supplies and Equipment.

5.

SCOPE

5.1

SUMMARY

a. This test procedure outlines the subtests to be performed to determine the suitability of meteorological balloon inflation and launching devices for artillery use. The tests will be conducted under field conditions using average soldiers trained in the appropriate military occupational specialty (MOS), and will serve as the basis for evaluating the test item's performance. The major categories and their included subtests are:

- a. Pre-Test Operations consisting of:

- 1) Technical Inspection - A check to verify that the test item is complete and in satisfactory condition prior to the start of testing.

- 2) Physical Characteristics - A verification of the physical characteristics of the test item.

b. Operational Characteristics - An evaluation of the test item suitability for being emplaced, prepared for operation and march ordered in daylight and darkness.

c. Operational Reliability - An evaluation to determine the ability to withstand being transported over a variety of terrains for a specified number of miles.

d. Transportability Tests consisting of:

- 1) Surface Transportability - A study to determine the suitability of the test item for surface transport.
- 2) Air Transportability - A study to determine the suitability of the test item for transport by aircraft both internally and externally.
- 3) Air Drop Capability - An evaluation of the suitability of the test item for air drop operations.
- 4) Logistics-over-the-Shore - A study to determine the capability of the test item to withstand logistics-over-the-shore operations and its suitability for such operations.

e. Vulnerability to Detection - A study to determine the degree of security from aural and visual detection that the test item has in its various modes. Ground and aerial observations are included.

f. Compatibility with Related Equipment - A study to determine the suitability of the test item for operations with its related equipment in various configurations.

g. Full-Test Evaluations consisting of:

- 1) Maintainability and Reliability - An evaluation to determine the suitability of the test item to be maintained, the adequacy of its maintenance package, and its overall ability to operate over long periods of time without adjustment or replacement of components.
- 2) Effects of Weather - An evaluation of the effects of various weather conditions on the operability of the test item.
- 3) Human Factors - An evaluation of the suitability of the test item for operation, servicing, transport and storage by service personnel without causing undue fatigue and mental errors.
- 4) Safety - An evaluation of the safeness of the test item in its various configurations, under a variety of conditions, and the resultant safety hazards to service personnel.

h. Post-Test Inspection - A repetition of the technical inspection to determine any adverse effects of testing on the test item.

i. Environmental Suitability - A repetition of the applicable procedures of items b through h under desert, arctic, and tropic conditions to determine the environmental effects on the test item operability, etc.

5.2 LIMITATIONS

This test procedure is limited to the testing of inflation, tethering and launching equipment for meteorological balloons. Balloon testing is described by MTP 6-3-182.

6. PROCEDURES

6.1 PREPARATION FOR TEST

6.1.1 Scheduling

6.1.1.1 Personnel

a. Ensure the availability of service personnel who have been trained according to the criteria of MTP 10-3-501 and are knowledgeable about the following aspects of the test item:

- 1) Installation
- 2) Operation
- 3) Maintenance

b. Record the following for all service personnel:

- 1) Rank
- 2) MOS
- 3) Training time
- 4) Experience

NOTE: Test personnel shall receive the minimum essential individual instruction in the operation and organizational, direct support, and general support maintenance of the test item. The achievement of a skill level to operate the test item under simulated combat conditions shall be a requirement, assuming that the test item can achieve results as set forth in the applicable QMR. Observations of operations and maintenance activities shall be made by technically qualified personnel.

c. Ensure that experienced personnel are available for the duration of testing.

6.1.1.2 Facilities and Equipment

a. Select and schedule the use of testing sites and facilities as required by the applicable subtests.

b. Upon notice of the arrival or estimated time of arrival of the test item, arrange for or secure the following:

- 1) Engineering safety release or a safety statement from the

- engineering agency as prescribed by references 4B and 4C.
- 2) Vehicles for transporting the test item, as applicable.
- 3) Maintenance support facilities, organization, and personnel.
- 4) Assistance of the U. S. Army Airborne, Electronics and Special Warfare Board (USAESWBD), as required, during the conduct of aerial delivery and air drop operations.
- 5) Assistance of the U. S. Army General Equipment Test Activity (USAGETA), as required, during the conduct of logistics over-the-shore operations.

6.1.2 Safety

- a. Verify that the test item safety statement is valid and up-to-date.
- b. Verify that all service test personnel have been adequately trained in the safety requirements pertaining to the test item and the testing.

6.1.3 Pre-Test Operations

6.1.3.1 Technical Inspection

Conduct a technical inspection of the test item as described by the applicable sections of MTP 10-3-500.

6.1.3.2 Physical Characteristics

Determine the physical characteristics of the test item as described by the applicable sections of MTP 10-3-500.

6.2 TEST CONDUCT

a. Subtests shall be conducted concurrently with, or in conjunction with other subtests, whenever possible, so that the time taken to collect the required data can be minimized.

b. Subtests shall be conducted under the conditions of weather prevailing during the period of testing.

6.2.1 Operational Characteristics

6.2.1.1 Daylight Conditions

Perform the following under daylight conditions:

a. Determine the suitability of the test item for being emplaced, prepared for action, operated and march ordered according to the criteria of MTP 10-3-506 and MTP 10-3-509.

NOTE: 1. A variety of balloons shall be used in this test.
2. Meteorological equipment carried aloft by the balloons shall be operability tested after launch (if specified by the test plan) according to procedures of MTP 6-3-180.

b. Subject the test item to a technical inspection as described by MTP 10-3-500 at the completion of each assembly-operation-disassembly sequence.

6.2.1.2 Darkness (Blackout) Conditions

Repeat the procedures of paragraph 6.2.1.1 under conditions of darkness (blackout).

6.2.2 Operational Reliability

a. Transport the test item over a minimum of 1000 miles over the following types of terrain:

- 1) Paved roads (25% of total)
- 2) Unpaved roads (50% of total)
- 3) Cross-country terrain (25% of total)

b. Emplace the test item after each 200-mile travel cycle and verify its operability according to the procedures of paragraph 6.2.1.

6.2.3 Transportability Tests

6.2.3.1 Surface Transportability

a. Determine the surface transportability of the test item as described by the applicable sections of MTP 10-3-503.

b. At the completion of the testing, subject the test item to a technical inspection as described by the applicable sections of MTP 10-3-500.

6.2.3.2 Air Transportability

NOTE: The conduct of air transportability testing shall be coordinated with the U. S. Army Airborne, Electronics and Special Warfare Board (USAAESWBD).

6.2.3.2.1 Internal Transport - Perform the following:

a. Determine the suitability of the test item for internal air transport as described by the applicable sections of MTP 7-3-515.

b. At the completion of the testing, subject the test item to a technical inspection as described by the applicable sections of MTP 10-3-500.

6.2.3.2.2 External Transport - Perform the following:

a. Determine the suitability of the test item for external air transport as described by the applicable sections of MTP 7-3-516.

b. At the completion of the testing, subject the test item to a technical inspection as described by the applicable sections of MTP 10-3-500.

6.2.3.3 Air Drop Capability

a. Determine the suitability of the test item for air drop operations as described by the applicable sections of MTP 7-3-512.

NOTE: The conduct of airborne operations shall be the responsibility of the U. S. Army Airborne, Electronics and Special Warfare Board (USAAESWBD).

b. At the completion of the testing, subject the test item to a technical inspection as described by the applicable sections of MTP 10-3-500.

6.2.3.4 Logistics-Over-the-Shore

a. Determine the capability of the test item for logistics-over-the-shore as described by the applicable sections of MTP 10-3-510.

NOTE: Logistics-over-the-shore requirements shall be coordinated with the U. S. Army General Equipment Test Activity (USAGEITA).

b. At the completion of testing, subject the test item to a technical inspection as described by the applicable sections of MTP 10-3-500.

6.2.4 Vulnerability to Detection

6.2.4.1 Daylight Condition - Perform the following:

a. Determine and record the maximum distance during operation at which the test item is audible to:

- 1) Unaided ear
- 2) Acoustic aids

b. Determine and record the maximum distances at which the test item is discernible without camouflage and with camouflage from ground positions using:

- 1) Unaided vision
- 2) Optical instruments

c. Determine and record the maximum attitudes at which the test item is discernible without camouflage and with camouflage from aerial observations using:

- 1) Unaided vision
- 2) Optical instruments
- 3) Aerial photography

NOTE: The conduct of the airborne operations shall be the responsibility of the U. S. Army Airborne, Electronics, and Special Warfare Board (USAAESWBD).

6.2.4.2 Darkness (Blackout) Conditions

Repeat paragraph 6.2.4.1 under conditions of darkness (blackout).

6.2.5 Compatibility with Related Equipment

Determine the compatibility of the test item with related components and devices as described by the applicable sections of MTP 6-3-512.

6.2.6 Full Test Evaluations

During the conduct of this MTP, the following characteristics shall be determined and/or evaluated.

6.2.6.1 Maintainability and Reliability

NOTE: The overall evaluation of the maintainability and reliability of the test item shall be made according to the criteria of reference 4D.

a. Complete the authorized maintenance tasks in accordance with the test item maintenance instructions and technical literature.

b. Determine the maintainability of the test item as described by the applicable sections of MTP 10-3-504.

c. Record the following, as applicable:

- 1) Time and number of personnel required to perform scheduled and non-scheduled maintenance tasks on the test item.
- 2) Frequency of repairs.
- 3) Test item down-time (cumulative).
- 4) Nomenclature of repair parts used.

d. Evaluate the adequacy and accuracy of the test item maintenance package.

6.2.6.2 Effects of Weather

a. Determine the effects of weather on the test item operability as described by the applicable sections of MTP 10-3-508.

b. Evaluate the ability of the test item transit case(s) to protect the test item from moisture, dust and other debris.

6.2.6.3 Human Factors

a. Determine the suitability of the test item design with respect to the man-equipment relationship as described by the applicable sections of MTP 10-3-505.

b. Determine and record the suitability and the compatibility of the test item with the service personnel who will operate and service it, with respect to their skills, aptitudes, and physical limitations.

NOTE: Each test item detail requiring human attention and/or manipulation shall be observed and evaluated.

6.2.6.4 Safety

- a. Determine the test item safety hazards resulting from storage, transport, operation and maintenance as described by the applicable sections of MTP 10-3-507.
- b. Prepare a safety confirmation in accordance with USATECOM Regulation 385-7.

6.2.7 Post-Test Inspection

Upon completion of testing, the test item shall be subjected to a technical inspection as described by the applicable sections of MTP 10-3-500. Any deleterious effects on the test item, due to the testing program, shall be recorded.

6.2.8 Environmental Suitability

The applicable procedures of paragraphs 6.2.1 through 6.2.6 shall be performed under desert, arctic and tropic environmental test conditions as described in MTP 10-4-001 (desert), 10-4-002 (arctic) and MTP 10-4-003 (tropic) to determine the effects of these conditions on the operability of the test item with emphasis on the following, as applicable:

- a. Effects on mobility.
- b. Time required for installation, emplacement, and march order.
- c. Time required to complete the action of inflation and launching when dressed in special clothing and equipment.
- d. Effects of extreme temperatures on lubricants or requirements for special lubricants, knobs, handles, cables, and machined movable parts.
- e. Effects of heavy rainfall, continuous high relative humidity of the air, dust, insects, and fungi (mold, mildew, and slime).

6.3 TEST DATA

6.3.1 Preparation for Test

6.3.1.1 Personnel

Record the following for all service personnel:

- a. Rank
- b. MOS
- c. Training time, in months
- d. Experience, in years

6.3.1.2 Pre-Test Operations

6.3.1.2.1 Technical Inspection -

Record data, collected as described in the applicable sections of MTP 10-3-500.

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6.3.1.2.2 Physical Characteristics -

Record data, collected as described in the applicable sections of MTP 10-3-500.

6.3.2 Test Conduct

6.3.2.1 Operational Characteristics

Record the following for each subtest conducted:

- a. Time of day, in hours.
- b. Weather condition (clear, rainy, snow, sleet, etc.).
- c. Visibility condition (daylight, darkness).
- d. Ambient temperature.
- e. Test item nomenclature.
- f. Record data, collected as described in the applicable sections of MPT 10-3-500 and MPT 10-3-506.
- g. Record technical inspection data, collected as described in the applicable sections of MTP 10-3-500.

6.3.2.2 Operational Reliability

Record the following after each 200-mile travel cycle:

- a. Mileage traveled over the following:
 - 1) Paved roads
 - 2) Unpaved roads
 - 3) Cross-country terrain
- b. Operability data, collected as described in paragraph 6.2.1.

6.3.2.3 Transportability

6.3.2.3.1 Surface Transportability -

Record data, collected as described in the applicable sections of MTP 10-3-503.

- b. Record technical inspection data, collected as described in the applicable sections of MTP 10-3-500.

6.3.2.3.2 Air Transportability -

- a. For internal transport:

- 1) Record data, collected as described in the applicable sections of MTP 7-3-515.
- 2) Record technical inspection data, collected as described in the applicable sections of MTP 10-3-500.

b. For external transport:

- 1) Record data, collected as described in the applicable sections of MTP 10-3-500.

6.3.2.3.3 Air Drop Capability -

a. Record data, collected as described in the applicable sections of MTP 7-3-512.

b. Record technical inspection data, collected as described in the applicable sections of MTP 10-3-500.

6.3.2.3.4 Logistics-Over-the-Shore -

a. Record data, collected as described in the applicable sections of MTP 10-3-510.

b. Record technical inspection data, collected as described in the applicable sections of MTP 10-3-500.

6.3.2.4 Vulnerability to Detection

a. Record the following for each aural observation:

- 1) Visibility condition (daylight, darkness).
- 2) Maximum distances, in meters, at which the test item and associated equipment can be detected by:
 - a) Unaided ear
 - b) Acoustic aids

b. Record the following for each visual observation from ground positions:

- 1) Visibility condition (daylight, darkness).
- 2) Test item emplacement condition (camouflaged, uncamouflaged).
- 3) Maximum distances, in meters, at which the test item is discernible by:
 - a) Unaided vision
 - b) Optical instruments

c. Record the following for each visual observation from aircraft:

- 1) Visibility condition (daylight, darkness).
- 2) Test item emplacement condition (camouflaged, uncamouflaged).
- 3) Maximum altitudes, in feet, at which the test item can be detected by:
 - a) Unaided vision
 - b) Optical instruments
 - c) Aerial photography

6.3.2.5 Compatibility with Related Equipment

Record data, collected as described in the applicable sections of MTP 6-3-512.

6.3.2.6 Full-Test Evaluations

6.3.2.6.1 Maintainability and Reliability -

Record the following:

- a. Data collected, as described in the applicable sections of MTP 10-6-504.
- b. Type of maintenance performed (scheduled, non-scheduled).
- c. Time required to perform each maintenance task, in hours.
- d. Number of personnel required to perform each maintenance task.
- e. Frequency of repairs over the period of testing (record dates).
- f. Test item down-time (cumulative), in hours.
- g. Nomenclature of repair parts used.

6.3.2.6.2 Effects of Weather -

Record data, collected as described in the applicable sections of MTP 10-3-508.

6.3.2.6.3 Human Factors -

Record the following:

- a. Data, collected as described in the applicable sections of MTP 10-3-505.
- b. Observations of service personnel during testing, and the suitability of the test item with respect to their:
 - 1) Skills
 - 2) Aptitudes
 - 3) Physical limitations

6.3.2.6.4 Safety -

Record data, collected as described in the applicable sections of MTP 10-3-507.

6.3.2.7 Post-Test Inspection

- a. Record data, collected as described in the applicable sections of MTP 10-3-500.
- b. Record any deleterious effects of the test program on the test item.

6.4 DATA REDUCTION AND PRESENTATION

Data obtained from all subtests covered by applicable MTP's shall be summarized, compared with "standard" data and evaluated according to procedures described in those applicable MTP's. Appropriate charts, graphs, and tabulated summaries shall be used to present the data in a clear manner. Special consideration shall be given to any condition or circumstance contributing to any test result.

Calculations shall be performed as specified by the individual MTP's, wherever applicable, and all photographs, motion pictures and illustrative material, shall be suitably identified.

Compute the maintenance ratio by determining the man-hours of maintenance for each hour of test item operation.

Compute the availability ratio by determining the hours of down-time for each hour of test item operation.

The qualitative and quantitative data collected shall also be evaluated in terms of the requirements specified in the QMR's and TC's which are applicable, to determine the degree of fulfillment of the test item performance specifications.

For the evaluation of the vulnerability of the test item to detection, average distances and altitudes shall be computed, tabulated, and compared for the various observation methods under the various conditions.

A safety confirmation based on the data of paragraph 6.3.2.5.4 shall be presented in accordance with USATECOM Regulation 385-7.